MULTIMEDIA UNIVERSITY

STUDENT ID NO

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# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

**TRIMESTER 2, 2019/2020**

## DCA5231 – COMPUTER ARCHITECTURE

(DIT)

05 MARCH 2020
9.00 a.m – 11.00 a.m
( 2 Hours )

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**INSTRUCTIONS TO STUDENT:**

1. This question paper consists of **THREE** pages.

2. Answer **ALL** questions.

3. Please write your answers in the answer booklet provided.

**Structured Questions, 4 Questions (Total: 40 Marks)**
***Instruction:*** *Answer ALL the questions in the Answer Booklet provided.*

**QUESTION 1 (10 Marks)**

a) Given the memory contents and the opcodes as shown below:

i. Show the contents of the registers (Program Counter (PC), Accumulator (AC) and Instruction Register (IR) after execution of each instruction from address 100 to 103.

ii. Please provide the memory contents of 200, 201, 202 and 203 after the final execution of fifth instruction.

(7 Marks)

| Address | Content |
|---|---|
| 100 | 1202 |
| 101 | 5201 |
| 102 | 6200 |
| 103 | 2203 |
| ... | ... |
| 200 | 200A |
| 201 | 1001 |
| 202 | 2001 |
| 203 | |
| ... | ... |

Original memory contents

| Instruction | Meaning |
|---|---|
| 0001 | Load AC from memory |
| 0010 | Store AC to memory |
| 0101 | Add to AC from memory |
| 0110 | Subtract memory from AC |

Partial list of opcodes

b) Briefly explain **TWO** major structural component of CPU.

(1 Marks)

c) Perform the following conversions. All the necessary steps to obtain the answers must be shown.

i. Convert $101010110011_2$ (binary) to its octal equivalent. (1 Marks)
ii. Convert $AFEC_{16}$ (hexadecimal) to its binary equivalent. (1 Marks)

**Continued.....**

**QUESTION 2 (10 Marks)**

a) Perform the calculation of $12_{10} - 19_{10}$ using 8-bits signed 2's complement binary numbers and convert your final answer in decimal.

(5 Marks)

b) Given the following expression,

$$\mathbf{Q = [\ ((Z * Y) - D\ ) / (G + (H / E)\ ]}$$

i. Convert the expression X to postfix notation. (1 Mark)

ii. Write the expression Q into the following machine instructions:

- One-address format (2 Marks)
- Two-address format (2 Marks)

**QUESTION 3 (10 Marks)**

a) Briefly explain **THREE (3)** differences between static RAM and dynamic RAM.

(3 Marks)

b) List and explain **FOUR (4)** buses in in bus hierarchy in most modern PCs nowadays.

(3 Marks)

c) Draw the memory hierarchy. Describe briefly **THREE(3)** facts that can be observed as one goes from top to bottom of the hierarchy.

(2.5 Marks)

d) What is Peripheral Component Interconnect Express (PCIe)? State **TWO (2)** key requirements for PCIe. (1.5 Marks)

**Continued.....**

**QUESTION 4 (10 Marks)**

a) When the processor, memory and I/O share a common bus, I/O devices can be interfaced with processor in two ways. State and explain the TWO (2) I/O interfacing techniques. (2.5 Marks)

b) An external device connected to an I/O module is often referred to as a peripheral device or, simply, a peripheral. List and briefly explain any **TWO (2)** categories of each external devices with **ONE**(1) example. (2 Marks)

c) Answer the following questions related to I/O techniques:
i) Briefly explain **Interrupt-Driven I/O** technique for I/O operations. (1.5 Marks)

ii) Provide two advantages of Direct Memory Access compared to Interrupt-Driven I/O. (1 Mark)

ii) Given the implementation of non-pipelining and pipelining for **TWENTY (20)** instructions that has **SEVEN (7)** stages pipeline with an equal delay of **0.2** seconds each. Calculate the total processing time, throughput and speedup for the both implementation.
(Note: Please write the appropriate formula) (3 Marks)

**End of Page.**